

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>Process</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/NO 00/ 00062</b>	International filing date ( <i>day/month/year</i> ) <b>21/02/2000</b>	(Earliest) Priority Date ( <i>day/month/year</i> ) <b>01/03/1999</b>
Applicant <b>MIKALSEN, Kaare, Mikal</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

a: With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

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☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

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2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐ None of the figures.

### Information for patent family members

PC 17-00 00/00062

Form PCT/ISA/210 (patent family annex) (July 1992)

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International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>C05F</b>	<b>A2</b>	(11) International Publication Number: <b>WO 00/51951</b> (43) International Publication Date: 8 September 2000 (08.09.00)
<p>(21) International Application Number: PCT/NO00/00062</p> <p>(22) International Filing Date: 21 February 2000 (21.02.00)</p> <p>(30) Priority Data: 19990967 1 March 1999 (01.03.99) NO</p> <p>(71) Applicants (for all designated States except US): MIKALSEN, Kaare, Mikal [NO/NO]; Borgundfjordveien, N-6017 Ålesund (NO). ØRSTAVIK, Arne [NO/NO]; N-6100 Volda (NO).</p> <p>(71)(72) Applicants and Inventors: MIKALSEN, Mikal [NO/NO]; Ytrestøyl, N-6100 Volda (NO). BJØRNØY, Håkon [NO/NO]; Gamlem, N-6280 Søvik (NO).</p> <p>(74) Agent: CURO AS; Box 38, N-7231 Lundamo (NO).</p>		<p>(81) Designated States: AU, JP, US, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> <i>In English translation (filed in Norwegian). Without international search report and to be republished upon receipt of that report.</i></p>
<p>(54) Title: PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL</p> <p>(57) Abstract</p> <p>Process tank for gentle treatment of its contents, particularly for treatment of organic material, which includes an agitation arrangement. The process tank is a double tank comprising an inner tank (3) with perforated wall areas which is rotatably supported with bearings in an outer tank with a substantially vertical axis (R-R) of rotation. The perforated areas of the inner tank (3) are provided with gratings (18) and shovels (9) are arranged slantingly in the space between the inner and the outer tank. The shovels, during rotation of the inner tank, contribute to the agitation of the fluid in the tank. Furthermore, a lid (7) is arranged to be raised and lowered on top of the inner tank. This lid is preferably also provided with gratings. The invention also concerns a method for treatment of organic material, such as fish waste, crab shells, krill or plant material, using the process tank according to the invention.</p>		

## INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/NO 00/00062

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B01F/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE DIALOG INFO SERVICES [Online] MITSUBISHI HEAVY IND LTD: "Liquid tank for minute gravitational space" retrieved from FILE 347: JAPI0, accession no. 03761599 XP002901111 abstract & JP 04 126699 A 27 April 1992 (1992-04-27) -----	1,11

☐ Further documents are listed in the continuation of box C.☐ Patent family members are listed in annex.

## ° Special categories of cited documents :

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- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search

22 June 2000

Date of mailing of the international search report

25.08.00

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11 Sep 2003

## INTERNATIONAL SEARCH REPORT

Internal Application No.

PCT/NO 00/00062

Patent document cited in search report	Publication date	Patent family member(s)	Publication no.
JP 04126699 A	27-04-1992	NONE	

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
8 September 2000 (08.09.2000)

PCT

(10) International Publication Number  
**WO 00/51951 A3**

(51) International Patent Classification<sup>7</sup>: **B01F 7/28**

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(21) International Application Number: PCT/NO00/00062

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(22) International Filing Date: 21 February 2000 (21.02.2000)

(81) Designated States (*national*): AU, JP, US.

(25) Filing Language: Norwegian

(84) Designated States (*regional*): Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

(26) Publication Language: English

(30) Priority Data:  
19990967 1 March 1999 (01.03.1999) NO

Published:  
— With international search report.

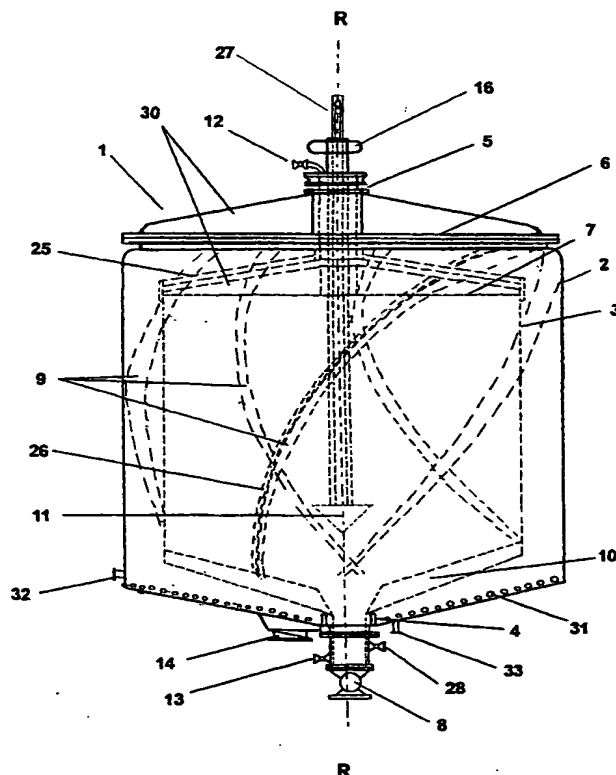
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(88) Date of publication of the international search report:  
21 December 2000

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(72) Inventors: MIKALSEN, Mikal [NO/NO]; Ytrestøyl,

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL



(57) Abstract: Process tank for gentle treatment of its contents, particularly for treatment of organic material, which includes an agitation arrangement. The process tank is a double tank comprising an inner tank (3) with perforated wall areas which is rotatably supported with bearings in an outer tank with a substantially vertical axis (R-R) of rotation. The perforated areas of the inner tank (3) are provided with gratings (18) and shovels (9) are arranged slantingly in the space between the inner and the outer tank. The shovels, during rotation of the inner tank, contribute to the agitation of the fluid in the tank. Furthermore, a lid (7) is arranged to be raised and lowered on top of the inner tank. This lid is preferably also provided with gratings. The invention also concerns a method for treatment of organic material, such as fish waste, crab shells, krill or plant material, using the process tank according to the invention.

WO 00/51951 A3

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PCT/NO 00/00062

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Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NO 00/00062

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>C05F</b>	<b>A2</b>	<b>(11) International Publication Number:</b> <b>WO 00/51951</b> <b>(43) International Publication Date:</b> 8 September 2000 (08.09.00)
<b>(21) International Application Number:</b> PCT/NO00/00062 <b>(22) International Filing Date:</b> 21 February 2000 (21.02.00) <b>(30) Priority Data:</b> 19990967 1 March 1999 (01.03.99) NO <i>01 Sep 01/30 nos</i> <b>(71) Applicants (for all designated States except US):</b> MIKALSEN, Kaare, Mikal [NO/NO]; Borgundfjordveien, N-6017 Ålesund (NO). ØRSTAVIK, Arne [NO/NO]; N-6100 Volda (NO). <b>(71)(72) Applicants and Inventors:</b> MIKALSEN, Mikal [NO/NO]; Ytrestøyl, N-6100 Volda (NO). BJØRNØY, Håkon [NO/NO]; Gamlem, N-6280 Sjøvik (NO). <b>(74) Agent:</b> CURO AS; Box 38, N-7231 Lundamo (NO).		<b>(81) Designated States:</b> AU, JP, US, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). <b>Published</b> <i>In English translation (filed in Norwegian). Without international search report and to be republished upon receipt of that report.</i>
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## PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL

The present invention relates to a process tank for gentle treatment of organic material, especially intended for treatment of organic material like fish waste, crab, krill or plant materials. The invention also relates to a method for processing organic material.

**Background**

In a process environment such as the fish processing industry there is a need to treat the raw material in an effective yet gentle way so that a highest possible yield, but still a very clean product, is achieved.

With the use of an ordinary stirring assembly, e.g. consisting of an anchor stirrer or the like, a part of the material which should be recovered will be crushed and will be lost with the process water. Furthermore, the extraction fluid will be contaminated with particles from the residue. Another disadvantage is that a part of the extraction fluid is held back with the residue, giving a loss compared to the theoretical yield.

There are many practical applications of such process tanks, for instance the removal of waste from the fish processing industry, processing of krill on board a trawler etc. An example from another area is the extraction of etheric oils from plant materials.

**Objective**

It is thus an objective with the present invention to provide a new and improved process tank which eliminates or significantly reduces the disadvantages mentioned above, and which facilitates an effective and yet gentle treatment of organic material, in which a higher yield of extracted material than previously obtainable can be achieved, without jeopardizing the quality of the product.

It is a further objective to provide a process tank which, to a high degree, is adapted for an industrial operation, where modification may be made to allow for automatic controlling etc, so that the overall economy of the processes is high.

### The invention

These and other objectives are achieved with a process tank for gentle treatment of its contents, especially intended for treatment of organic material, including means for agitation and characterized in that the process tank is a double tank comprising an inner  
5 tank with perforated wall areas which are rotatably supported with bearings in an outer tank with a substantially vertical axis of rotation, the perforated areas of the inner tank being provided with gratings and shovels being arranged slantingly in the space between the inner and the outer tank, said shovels, during rotation of the inner tank contribute to the agitation of the fluid in the tank, and a lid arranged to be raised and lowered on top  
10 of the inner tank, said lid preferably is provided with gratings.

The invention also concerns a method for processing organic material such as fish waste, crab shells, krill or plant material in which a gentle agitation of the material is preferred, by introducing the material into a process tank together with a controlled amount of processing liquid and subjecting the material to a process under *per se* known  
15 conditions, the method being characterized by the following steps, utilizing a double process tank which comprises an inner tank with perforated wall areas with gratings, said inner tank being rotatably supported with bearings in an outer tank with a generally vertical axis of rotation, choosing gratings with a mesh size such that the entire solid material is retained in the  
20 inner tank, controlling process parameters like temperature and pH according to the nature of the relevant process, agitating the process liquid by allowing the inner tank to rotate relative to the outer tank such that shovels between the inner and the outer tank facilitate a gentle agitation of the  
25 material, and compressing the solid material at the end of the treatment by means of a rising and lowering lid on the inner tank prior to and during the draining of the processing fluid from the tank.

Preferred embodiments of the invention and the method are disclosed by the  
30 dependent claims.

In the following description further elaboration of various features of the invention is given by way of reference to a normal operation cycle illustrated by the enclosed drawings, where

Fig. 1 shows a vertical section through an embodiment of a tank according to the invention, in which some details lying outside the plane of the section are indicated by dotted lines,

Fig. 2a is a sideview of the inner tank of the the tank shown on fig. 1, showing gratings and its suporting structure.

Fig. 2b is a sideview of the inner tank of the tank shown on fig. 1, where the gratings and the supporting structure is left out to emphasize other details,

Fig. 3 depicts the lid on the inner tank from above.

Figure 1 shows a double tank 1 according to the invention with a solid wall 2 in the outer tank and a perforated wall 3 in the inner tank, and common bearings 4, 5 for both tanks about a vertical axis R-R. The outer tank has a lid 6 and the inner tank has a preferably perforated lid 7, the lid 7 being arranged so that it can be lowered in relation to the tanks around a spline shaft 15. Both the lids 6, 7 are strengthened by means of "cavelles" 30. Under the tank is shown a ball plug valve 8 through which material may be pumped into the tank for treatment, and through which the resdiue may be removed subsequent to the treatment.

Between the inner wall 3 and the outer wall 2 shovels 9 are indicated, some of which are attached to the inside of the outer wall 2, some of which are attached to the outside of the inner wall 3, so that a cooperation between these provides an agitation of the fluid in the tank when the inner tank rotates. Impellers 10 are shown at the bottom of the inner tank, the size and configuration of which will determine its contribution to a further agitation of the tank contents. For some applications it may also be appropriate to include a scraping shovel as indicated by reference numeral 11 on fig. 1. A supply conduit 12 for rinsing water is shown at the top of the tank as is a conduit 13 for the supply e.g. of nitrogen ( $N_2$ ) at the bottom of the tank. Also illustrated in Fig. 1 is a throttle valve 14 for draining of extraction fluid located upon the bottom of the tank.

Figures 2a and 2b show views of the inner tank, where several of the details from figure 1 are found, such as inner wall 3, rotation axis R-R, lid 7, shovel 9 (the ones fixed to the outside of the inner tank), impeller 10 at the supporting structure 17 of the inner tank, as well as gratings 18 at the open areas of the tank wall. A helically shaped groove 19 for guidance of the lid 7 during its lowering and raising movement is also indicated, said guidance groove 19 being arranged upon the inside of the tank wall 3. Guidance groove 19 functions as a "thread" for lid 7. At the top of the tank is a manhole which is sealed by a water- and airtight lid most of the time. Dotted lines  $L_t$  and  $L_b$  indicate the uppermost and the lowermost position of the lid 7. Figure 2b also shows castors 23 arranged to cooperate with the guide grooves 19 during lowering and raising of the lid.

Figure 3 shows the lid 7 with perforated areas 20 covered by gratings, distribution tubes 21 and rubber hoses 22 (four shown on the drawing) for washing liquid to the ejector tube 24 being supplied through the supply conduit 12 (fig. 1) through a particular device at the centre of the lid. An arrow to the left of fig. 3 indicates the rotational direction for normal operation. The drawing also illustrates the branching of the distribution tubes 21 which run along the carrier arms 25 from the axis where the distributions tubes 21 are connected to chemical resistant rubber tubes 22 or the like which in turn run from the supply tubes 21 to the ejector tube 24 along the circumference of the lid. These (rubber hoses) will not be exposed to particularly heavy wear as there will only be a downwards movement proportionally to the rotation when the lid is lowered.

The gratings 18 can be interchanged to ones with desired mesh size according to the kind of material which is treated. The agitation in the tank is effected by rotating the inner tank so that an agitation effect between the outer tank and the inner tank is obtained by means of the shovels 9, and optionally by means of impellers 10 at the bottom of the inner tank. In a preferred embodiment of the invention, the impellers 10 at the bottom of the inner tank is designed in a manner that enables them to force liquid from the centre of the tank outwards to the wall, while the shovels between the inner and the outer tank are so designed that they lift the liquid upwards in the region between the two walls. The overall effect is a generally downward movement of the liquid in the central region of the tank, and an effective, yet gentle agitation. The impellers 10 may

be inside the inner tank as shown on the drawing, or they may be outside the inner tank or partly inside, partly outside the inner tank.

To allow for a maximum movement of the liquid, it is beneficial that substantial areas of the inner tank are perforated and covered with gratings, and that the supporting  
5 structure only is sufficient to provide the tank with its necessary strength and rigidity. It is thus preferred that also the lid 7 of the inner tank is perforated and provided with gratings 18. The inner lid is arranged so that it can be lowered down into the inner tank. This is most easily done by arranging it with a central bushing 29 (fig. 2b) over a spline  
10 shaft 15 relative to the rotation of the inner tank, e.g. performed by means of an hydraulic braking arrangement. Outer guidance grooves 19 on the inside wall of the inner tank ensures that the lid is all the time held in a level position relative to the tank during this operation. For maximum versatility, it is beneficial to provide the lid 7 with some kind of castors 23 which roll along these guidance grooves 19 when the lid is  
15 moving up or down. The guidance grooves 19 are in a preferred embodiment designed such that the lid 7 rotates half a turn in relation to the inner tank when moving from its top position to its bottom position. The ascend angle of the guidance grooves should not exceed about 27°.

It is also preferred, as shown on figure 3, to provide an ejector tube 24 to the inside of  
20 the lid 7, said ejector tube comprising a series of nozzle openings. The purpose of this arrangement is to wash/ shower the wall of the inner tank while the lid 7 is being lowered, so that the entire residue is collected at the bottom of the inner tank, and ensuring that the downward movement of the inner tank is not hindered by remaining solid material which can stick to the gratings 18 or to the guidance grooves 19. This  
25 will also prevent solids remaining from ending up on top of the lid 7 when it is lowered. The supply of liquid is most conveniently performed through a bore in the central shaft. The rinsing liquid is normally taken from the process tank by means of a pump.

The most important objective with the feature of lowering the lid 7 is to facilitate a controlled compression of the raw material/ residue in the tank prior to the draining of  
30 the extraction liquid, so that as little as possible of the extraction liquid is held back. This further prevents the residue from acting like a filter which will hold back some of the material which is desired to be transferred with the extraction liquid. By holding the

material steady, the tank is also stabilized so that its rotational speed can be increased, which leads to an improved centrifugation of the residue.

The most practical way to attach the inner tank is at its upper end by means of carrier arms 25 which in turn are connected to the pinion shaft. The lid 7 can be attached by a  
5 so-called spline-bushing 29 to the spline shaft 15. The outer lid is strengthened with "cavelles" 30 and attached water and airtight to the outer tank, preferably with bolts.

By another preferred embodiment of the invention, a scraping shovel 11 is provided in the centre of the inner tank, which preferably is mounted on a shaft 27 led through the centre of the spline shaft 15, which is designed with a central bore with dimension to  
10 accomodate said shaft 27 for the scraping shovel 11. The function of the scraping shovel is to remove material from the inlet / outlet opening 8 centrally at the bottom of the tank. There is no need for automatic controlling of the scraping shovel as it will only be operated when needed.

At the start-up of a typical process, raw material is pumped into the inner tank through  
15 the ball plug valve 8. The outlet for the extraction liquid is close to the inlet opening for the raw material, and can have the form of a throttle valve. This is pumped to a separate tank for further treatment.

The simplest way for emptying the tank of solid material, includes filling the tank with liquid and allowing the tank to rotate in a direction opposite to the rotation of  
20 normal operation, while the lid is maintained in its upper position.

It is convenient to have the possibilty to supply gas to the tank. Most commonly inert gas is added to prevent oxidation of the raw material, but gases for special purposes, like additives can also be added if desired. For this purpose and according to the needs, one or more gas supplies may be provided.

25 Conveniently there is a drain in the lower part of the lower bearing so that the bearing can be drained before maintenance or replacement. The bearing may also be drained of any liquid during a longer stop of the tank or prior to change of extraction liquid.

Regarding the arrangement of the rotational axis R-R, it is evident that a certain deviation from a completely vertical arrangement in principle is possible, but it is  
30 inconvenient with respect to the strain thereby brought upon the tank and its bearings when the inner tank is set to rotate rapidly.



The rotational speed of the tank may vary within wide limits, but typically it will be set such that the absolute speed is in the range of 0.5 - 1 m/s at the periphery of the tank for an ordinary process. After completed processing, the residue is preferably centrifuged in order to remove as much as possible of the process liquid. During  
5 centrifugation the absolute speed at the periphery will typically be within 3.5 - 6 m/s.

A process tank according to the invention will normally contain a number of per se known devices for controlling process parameters, primary temperature and liquid level. Such devices can be quite simple electrical heaters, heat exchangers and/ or pipe  
10 loop 31 covering substantially the entire conical part of the bottom, with an inlet 32 arranged to the lower part of the outer tank just above the conical part. The outlet of condensate is arranged close to the bottom valve of the tank. The entire loop 32 is arranged so that it has a vertical distance of e.g. 10 cm from the conical bottom, which ensures a good contact between the steam loop and the extraction liquid. It is also  
15 possible to provide a steam jacket around the entire tank in order to heat it. In order to optimize energy the extraction liquid can be circulated through an external heat exchanger where condensate from the steam loop assists in heating the extraction liquid, or the extraction liquid can be preheated in a similar arrangement when supplied to the tank.

20 The construction of the inner tank may also be additionally strengthened so that the lid 7 may conduct a further compression of the material when the lid 7 is lowered.

The size of the tank may also be varied within wide limits and is actually only restricted by the needs of the actual applications.

In the following description some practical examples of the utilization of the tank are  
25 given.

#### Example 1

##### Ensilage of fish waste

Raw material consisting of fish waste from a fish processing plant is pumped into a tank  
30 according to the invention while the inner tank is already set to rotate. The raw material enters through the centre 8 of the bottom of the tank into the inner, perforated tank. Process water and blood water is separated from the raw material inside the tank and

pumped out through outlet 14. When the tank is suitably filled, water and acid are added to a desired concentration through a perforated supply tube 26 which follows the shovels 9 on the outer tank. The acid thus becomes evenly distributed from top to bottom. The tank is heated to appropriate temperature for effecting ensilation. During the process the

5 lid 7 may be lowered if needed or desired. After completed ensilation, the lid 7 is lowered while the wall 3 of the inner tank is washed through the openings on the tube 24, whereafter the ensilage is pumped out through outlet 14 until the tank is empty of free liquid. Thereafter the rotational speed is increased and the remaining material is centrifuged of ensilage. When the subsequent remaining material is to be pumped out,

10 the rotational direction of the inner tank is reversed and the lid 7 is raised to its top position. An appropriate amount of water is then pumped into the tank and the remaining material pumped out through valve 8 for subsequent treatment or depositing.

### Example 2

#### 15 Crab / lobster shells

Shells are crushed in a mill before being pumped into the tank through valve 8. When the inner tank is full, water is added and heated to desired temperature. An appropriate enzyme may also be added. Liquid additives like acids or bases are added through the supply tube 26 along the shovels 9 of the outer tank to a desired concentration. When

20 the desired enzyme activity has taken place, the lid 7 is lowered and the resulting liquid is pumped out through the outlet 14 of the outer tank, the shells are centrifuged to remove as much as possible of the remaining liquid. The liquid can thereafter be processed further to e.g. taste substances. In the same manner as described in example 1, it is preferred to rinse the wall 3 of the inner tank while the lid is lowered.

25 The lid is raised to its top position and water is filled into the tank. When it is full, it is heated to desired temperature and acid is added to desired concentration. The shells are demineralised to chitin under controlled conditions wherein addition of acid is added subsequently along with the progress of the demineralisation. When the demineralisation is complete, the lid 7 is lowered with simultaneous washing of the wall

30 3 of the inner tank, and the tank is emptied of liquid through the outlet 14 of the outer tank. The residue material is then centrifuged. The lid is thereafter raised to its top position again and water is added for washing of the shells. The lid is again lowered and

the rinsing water is pumped out through the outlet 14 of the outer tank. When the chitin finally is pumped out, this process is handled as described by example 1, i.e. by filling the tank with water and rotating the inner tank in the reverse direction with open valve 8, draining the chitin out.

5

### Example 3

Plant material for extraction of etheric oils

Relevant plants/ herbs are introduced to the tank in the form of a pumpable suspension through valve 8 or possibly through the manhole 20. Desired extraction liquid is added.

- 10 The tank is heated to desired extraction temperature. During the extraction the lid 7 may be lowered if needed or desired. After extraction is performed the lid 7 is lowered and the extraction liquid pumped out through outlet 14. The residue material is centrifuged and compressed prior to a new extraction or prior to the draining of the material through valve 8.

15

### Example 4

Krill

For this example it is convenient that the tank is placed onboard a krill trawler. When the krill is caught, the "flesh" is squeezed out in a normal manner. The krill waste is

- 20 thereafter pumped into the tank through valve 8 and when the inner tank is full, the tank is filled preferably with seawater. The liquid is heated to desired temperature. An autolysis of the shells will now take place. When the autolysis is complete all the protein will be dissolved. The lid 7 is then lowered for compressing the shells under simultaneous washing of the wall 3 of the inner tank, whereafter the protein rich and oil
- 25 inclusive liquid be pumped out through outlet 14 possibly for subsequent treatment. The shells remaining in the tank are centrifuged to remove as much as possible of the protein rich oily liquid. Thereafter the tank is filled preferably with fresh water, the shells are washed and the procedure of pumping out repeated. When the tank has been emptied for rinsing water and the shells have been centrifuged, the tank is
- 30 again filled with fresh water, acid is added to a desired concentration like in the preceding examples in order to demineralise the shells. The tank is heated to a desired temperature and acid concentration and temperature held constant during the entire

demineralisation process. When this process is completed, typically after 1 to 4 hours, the lid 7 is lowered so that it compresses the shells/ chitin and the mineral rich liquid is pumped out through the outlet 14 of the outer tank. When the tank has been emptied of liquid, the rotational direction is reversed and the lid is raised to its top position while  
5 water is filled onto the tank for washing of the chitin. The chitin is washed and compressed and the rinsing water pumped out through outlet 14. When all the (free) rinsing water has been removed, the chitin is centrifuged for remaining water.

Finally the tank is filled with water and the lid raised to its top position. The rotational direction is reversed and the chitin is pumped out thorough inlet / outlet 8 of the  
10 inner tank.

The examples above should merely be regarded as examples of how the process tank may be utilized. The scope of the invention is limited only by the following claims.

## Claims

1. Process tank for gentle treatment of its contents, particularly treatment of organic material, including means for agitation,  
5 **characterized** in that the process tank is a double tank comprising an inner tank (3) with perforated wall areas which are rotatably supported with bearings in an outer tank with a substantially vertical axis (R-R) of rotation, the perforated areas of the inner tank (3) being provided with gratings (18) and shovels (9) being arranged slantingly in the space  
10 between the inner and the outer tank, said shovels, during rotation of the inner tank, contribute to the agitation of the fluid in the tank, and a lid (7) arranged to be raised and lowered on top of the inner tank, said lid preferably is also provided with gratings.

2. Process tank according to claim 1,  
**characterized** in that the inner tank (3) is rotatably carried by an upper bearing (5) in  
15 the lid (6) of the outer tank, and that a lower bearing (4) mainly functions as a guide for the inner tank.

3. Process tank according to claim 1,  
**characterized** in that the inlet of raw material and the removal of solids takes place  
20 through a conduit which communicates with a valve (8) arranged concentrically with the lower bearing.

4. Process tank according to claim 1,  
**characterized** in that some of the shovels (9) between inner and outer wall (3, 2) are  
25 stationary shovels fixedly arranged to the inside of the outer wall (2), and others are shovels attached to the outside of the inner wall (3) and thereby rotate along with the inner tank.

5. Process tank according to claim 1,  
30 **characterized** in that the lid (7) on the inner tank is supported by a bushing (29) on a spline shaft (15) or the like, said spline shaft being arranged concentrically with the

tanks, the lid (7) being arranged to be lowerable by means of a braking mechanism on the spline shaft (15).

6. Process tank according to claim 1,

5 **characterized** in that a nozzle tube (24) is attached along the periphery of the lid (7), said nozzle tube being intended for washing the wall (3) of the inner tank, particularly in conjunction with lowering the lid (7).

7. Process tank according to claim 1,

10 **characterized** in that impellers (10) at the bottom of the inner tank contribute to moving extraction liquid from the centre of the tank out to the wall of the inner tank (3), and such that the liquid will pass through the gratings (18) out to the shovels (9) between the inner (3) and the outer wall (2).

15 8. Process tank according to claim 1,

**characterized** in that the shaft (15) for the lid (7) is provided with a bore and that through this bore there is arranged the shaft of a scraping shovel (11) which can be lowered in the case of packing, to scrape away material covering the inlet/ outlet communicating with the valve (8).

20

9. Process tank according to claim 1,

**characterized** in that guidance grooves (19) are arranged on the inside of the inner tank (3) to cooperate with grooves or castors (23) on the lid (7) to guide the movement of the lid up and down, while functioning as a "thread" for the lid.

25

10. Process tank according to claim 1,

**characterized** in that perforated tubes (26) are arranged along the entire length of one or more of the shovels (9) on the outer tank (2) for the supply of desired chemicals.

30 11. Method for processing organic material such as fish waste, crab shells, krill or plant material in which a gentle agitation of the material is preferred, by introducing the

material into a process tank together with a controlled amount of processing liquid and subjecting said material to a process under *per se* known conditions,

**characterized** by the following steps,

utilizing a double process tank which comprises an inner tank with perforated wall areas

5 with gratings, said inner tank being rotatably supported with bearings in an outer tank with a generally vertical axis of rotation,

choosing gratings with such a mesh size such that the entire solid material is retained in the inner tank,

controlling process parameters like temperature and pH according to the nature of the  
10 relevant process,

agitating the process liquid by allowing the inner tank to rotate relative to the outer tank so that shovels between the inner and the outer tank facilitate a gentle agitation of the material, and

compressing the solid material at the end of the treatment by means of a rising and  
15 lowering lid on the inner tank prior to and during the draining of the processing fluid from the tank.

12. Method according to claim 11,

**characterized** in that the filling of material takes place at the bottom of the tank through  
20 a bottom valve and a filling tube which is located concentrically with the axis of the tank, while the inner tank rotates, and with its lid in a top position.

13. Method according to claim 11,

**characterized** in that the processing liquid is an extraction liquid.  
25

14. Method according to claim 11,

**characterized** in that the wall of the inner tank is rinsed with water during whole or part of the process period, through nozzles arranged at the underside of the movable lid.

30 15. Method according to claim 11,

**characterized** in that the residue is centrifuged and or compressed after completed processing.

16. Method according to claim 11,  
**characterized** in that the lid of the inner tank is raised and lowered at certain intervals during the process.

5 17. Method according to claim 11,  
**characterized** in that the rotational direction of the inner tank is reversed when the tank is emptied of its solid contents.

18. Method according to claim 11,  
10 **characterized** in that the liquid is drained from another outlet at the bottom of the outer tank with no communication into the inner tank.

19. Method according to claim 11,  
**characterized** in that the raw material is pumped into the tank together with a  
15 transportation liquid such as water, and that this liquid may circulate while transporting the solid into the tank.

20. Method according to claim 11,  
**characterized** in that the rinsing liquid supplied to the nozzle tube along the lid of the  
20 inner tank is taken from the process tank.



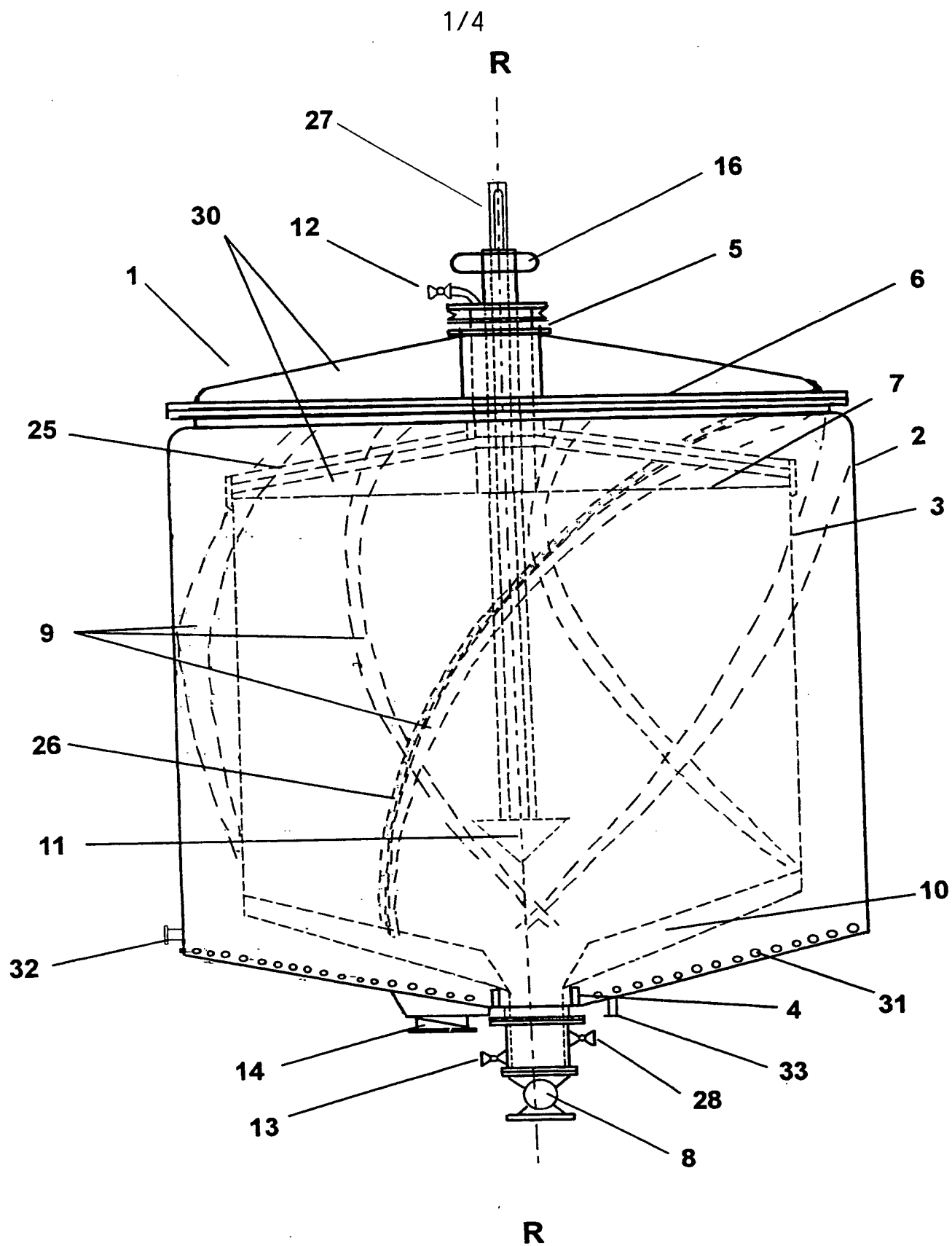


Fig. 1

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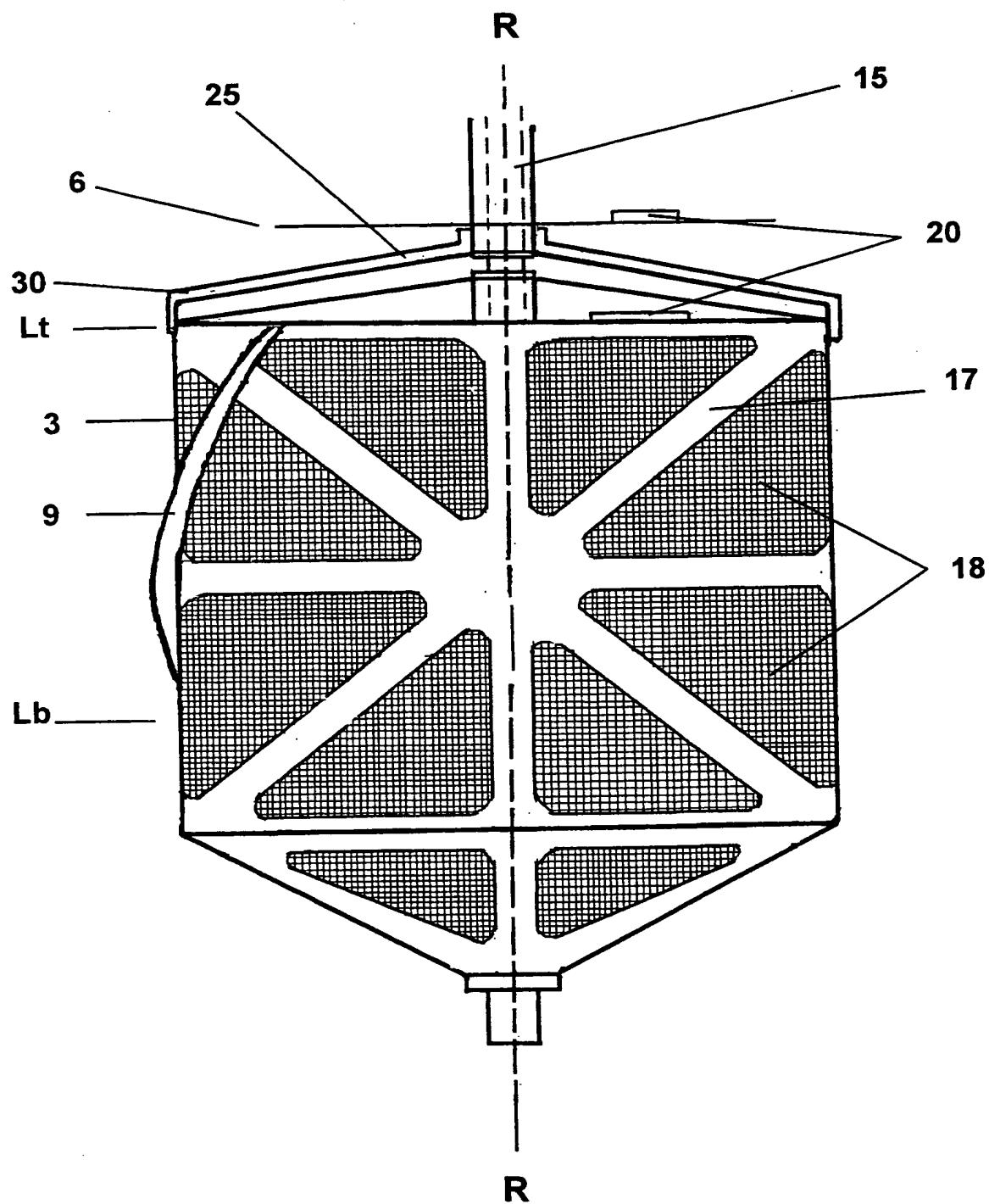


Fig. 2a

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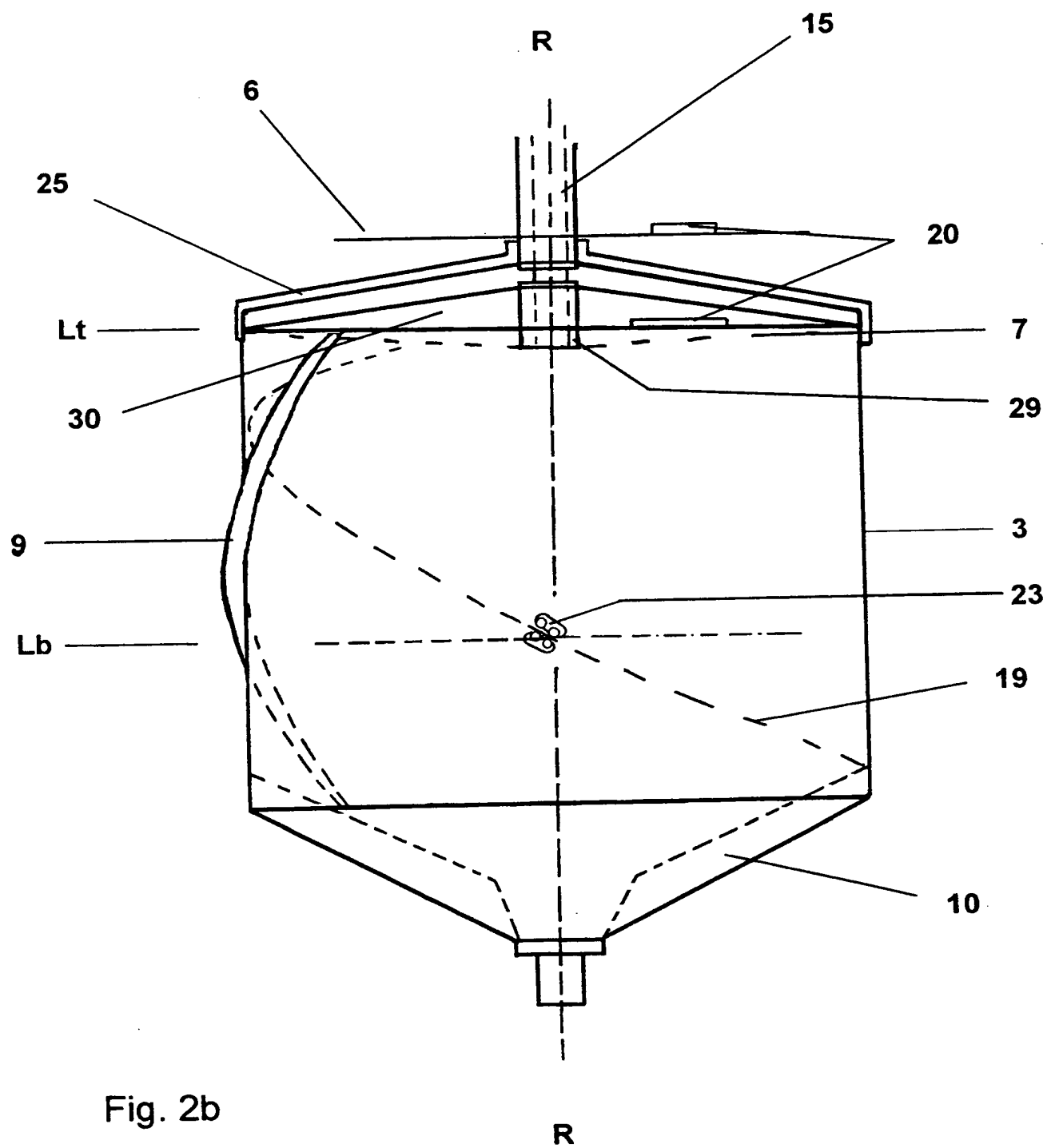
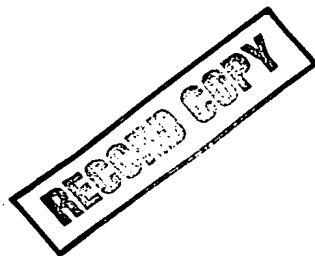


Fig. 2b





PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

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PCT/NO 00 / 00062

International Application No.

21 FEB. 2000 (21.02.2000)

International Filing Date



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PCT International application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) Process

## Box No. I TITLE OF INVENTION

Process tank and method for non-vigorous processing of organic material.

## Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:  
NorwayState (that is, country) of residence:  
Norway

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

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Mikalsen, Mikal  
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This person is:

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☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)
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## Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:



agent



common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

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Norway

Telephone No.

47 7285 4500

Facsimile No.

47 7285 4780

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

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Ørstavik, Arne  
N-6100 Volda  
Norway

This person is:

- ☒ applicant only  
☐ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Norway

State (that is, country) of residence:

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Gamlem  
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This person is:

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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: -----		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) (01.03.1999) 01 March 1999	19990967	Norway		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 19990967

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

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ISA / EP

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### Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 4  
description (excluding sequence listing part) : 11  
claims : 4  
abstract : 1  
drawings : 4  
sequence listing part of description : \_\_\_\_\_

Total number of sheets : 24

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
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9. ☒ other (specify): Search Rep. 19.08.99

Figure of the drawings which should accompany the abstract:

Language of filing of the international application: (English) NORWEGIAN A

### Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Lundamo, 17 February 2000

CUROAS

*Reiel Folven*

Reiel Folven

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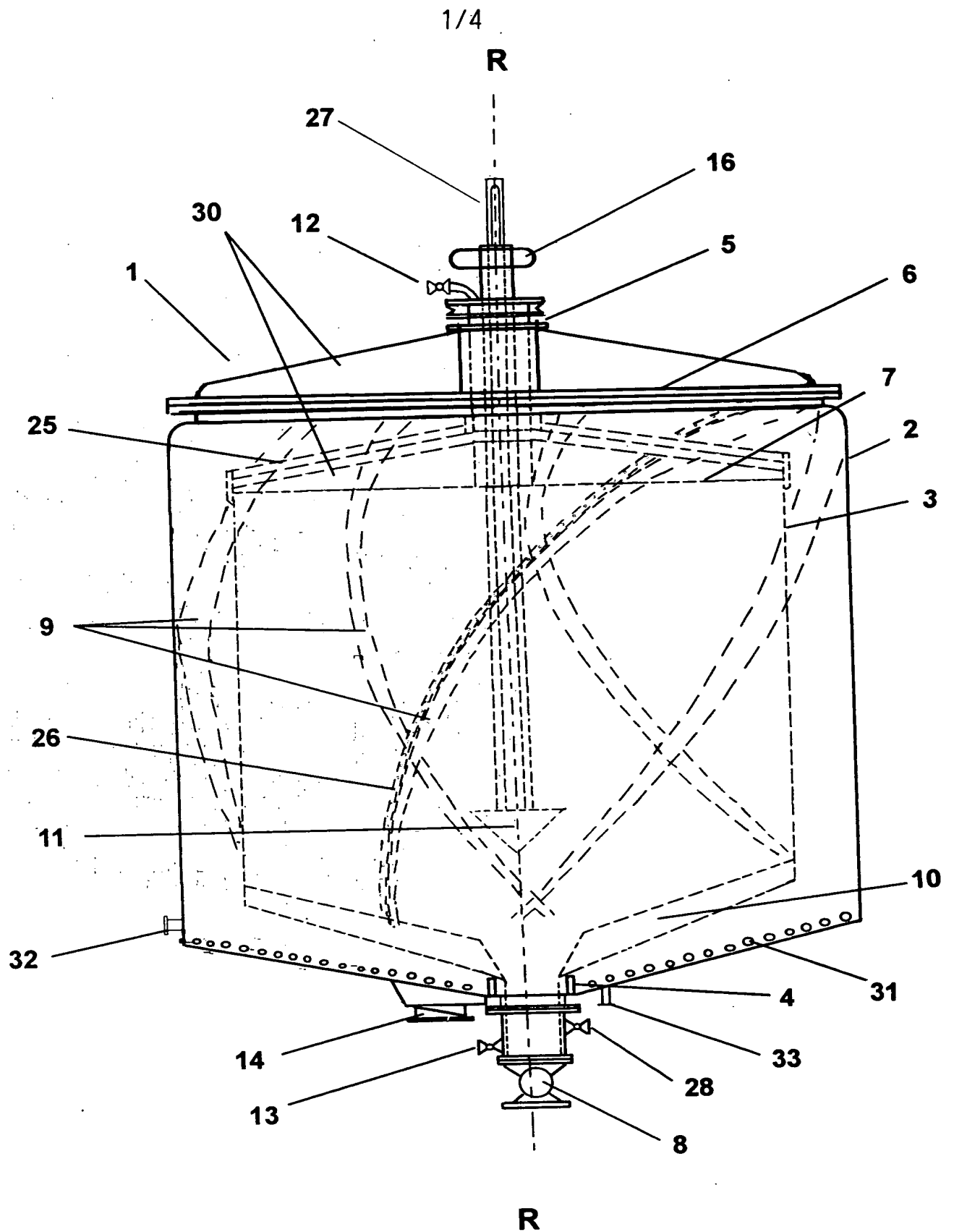


Fig. 1

2/4

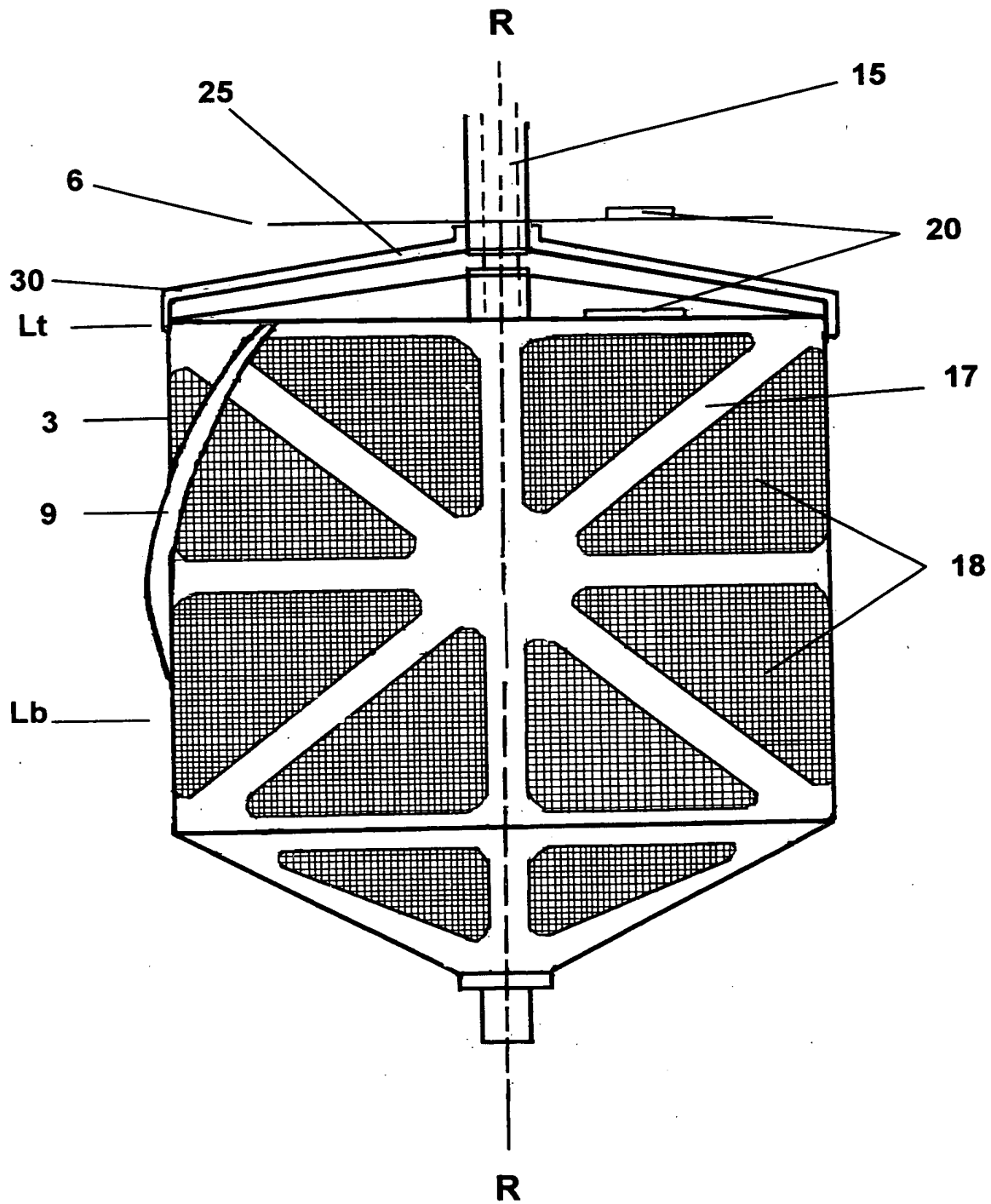


Fig. 2a

3/4

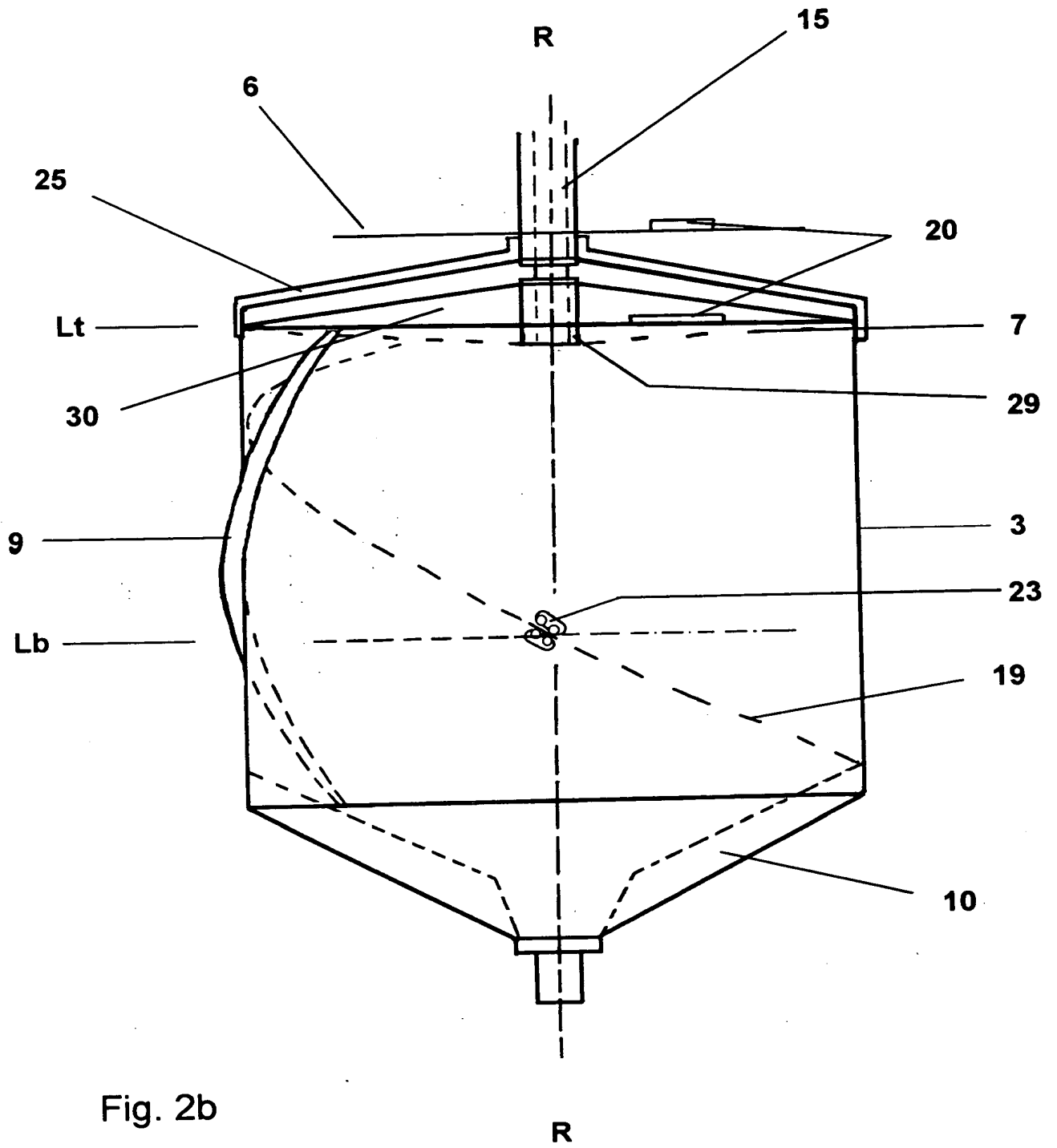


Fig. 2b

4/4

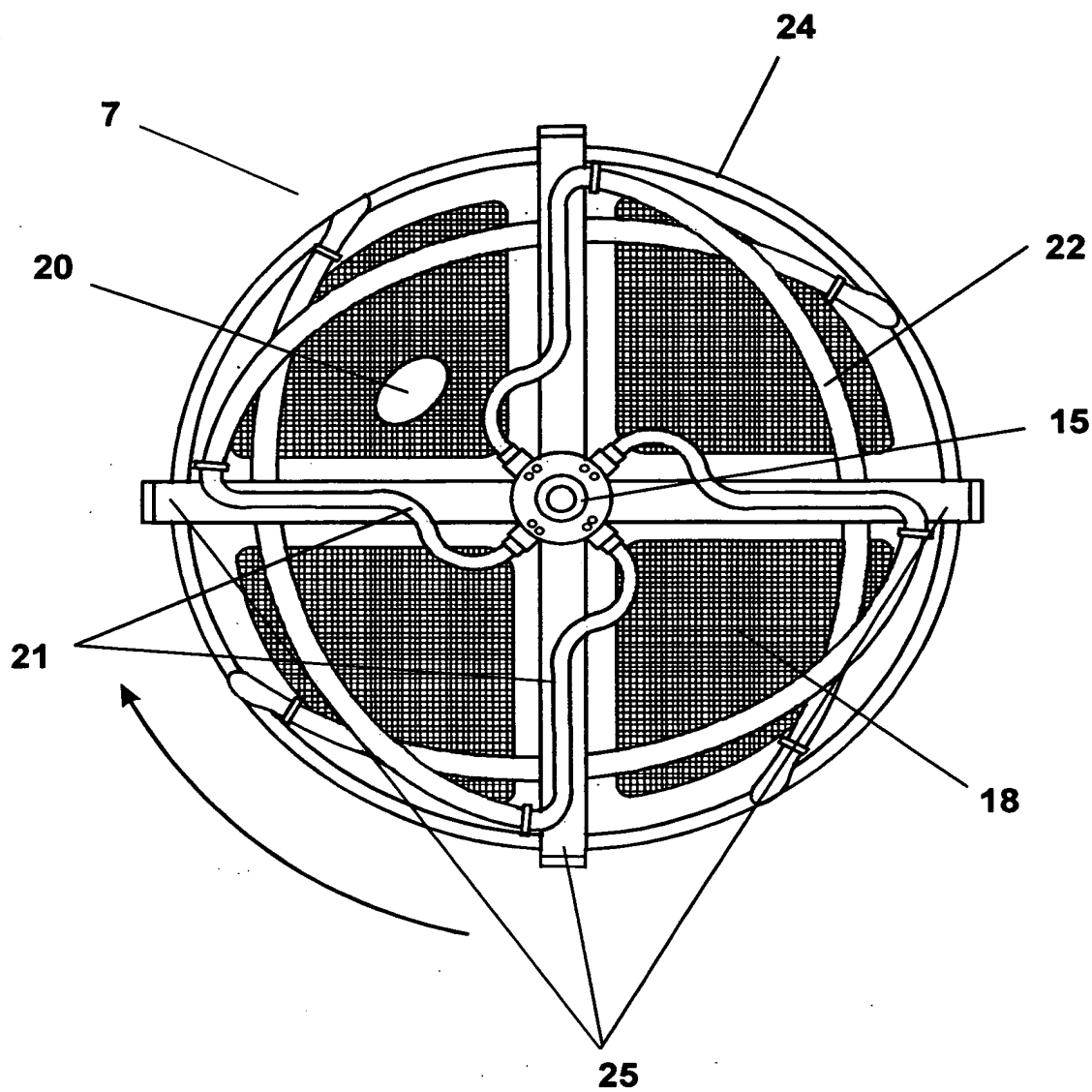


Fig. 3

Prosesstank og fremgangsmåte for skånsom behandling av organisk materiale.

Foreliggende oppfinnelse vedrører en prosesstank for skånsom behandling av organisk materiale, spesielt beregnet for behandling av organisk materiale som fiskeavfall,

- 5 krabbe, krill eller plantematerialer. Oppfinnelsen angår også en fremgangsmåte for prosessering av organisk materiale.

### Bakgrunn

Det er blant annet innen fiskeforedlingsindustrien et behov for å kunne behandle

- 10 råstoffet på en effektiv, men likevel skånsom måte, slik at man får størst mulig utbytte og likevel et svært rent utbytte.

Ved bruk av vanlig røreverk som omfatter for eksempel en akerrører e.l., vil en del av

det materiale man ønsker å ta vare på, bli knust og forsvinne med prosessvannet, og man

- 15 vil få ekstraksjonsvæsken forurenset med partikler fra residuet. Andre ulemper er at en del av ekstraksjonsvæsken blir holdt tilbake i residuet, slik at det oppstår et tap i forhold til teoretisk utbytte.

Det finnes mange praktiske applikasjoner for slike prosesstanker, for eksempel når det

- 20 skal tas vare på slakteslo fra fiskeindustri, prosessering av krill på en tråler etc.. Et eksempel fra et annet område er ekstraksjon av eteriske oljer o.l. fra plantematerialer.

### Formål

Det er et formål ved foreliggende oppfinnelse å tilveiebringe en ny og forbedret

- 25 prosesstank som eliminerer eller i vesentlig grad reduserer de ovennevnte problemer, og som muliggjør en effektiv og skånsom behandling av organisk materiale, der man oppnår et høyere utbytte av ekstrahert materiale enn hva som tidligere har vært mulig, uten at dette går på bekostning av renhet.

- 30 Det er videre et formål å tilveiebringe en prosesstank som i stor grad er tilpasset industriell drift, hvor det er lagt til rette for stor grad av automatisk styring etc., slik at totaløkonomien i prosessen blir god.

### Oppfinnelse

Disse og andre formål oppnås ved hjelp av en prosesstank for skånsom behandling av dens innhold, spesielt beregnet for behandling av organisk materiale, omfattende et

5 røreverk, kjennetegnet ved at prosesstanken er en dobbelttank omfattende en indre tank med perforerte veggområder som er roterbart opplagret i en ytre tank med tilnærmet vertikal rotasjonsakse, at den indre tank er forsynt med silerister som dekker de perforerte områder av veggen, at det mellom indre og ytre tank er anordnet skråstilte skovler eller strømningsbrytere som under rotasjon av indre tank bidrar til omrøring av

10 væsken i tanken, samt at den indre tanken er forsynt med et hev- og senkbart lokk som fortrinnsvis også er perforert.

Oppfinnelsen angår også en fremgangsmåte for prosessering av organisk materiale så som fiskeavfall, krabbeskall, krill eller plantemateriale hvor skånsom omrøring av

15 materialet er ønskelig, ved at materialet tilføres en prosesstank sammen med regulert mengde av prosessvæske og underkastes en behandling under i og for seg kjente betingelser i prosesstanken, hvilken fremgangsmåte er kjennetegnet ved følgende trinn: det benyttes en dobbelt prosesstank omfattende en indre tank med perforerte veggområder og silerister, hvilken indre tank er roterbart opplagret med en tilnærmet

20 vertikal rotasjonsakse i en ytre tank,

sileristene velges med slik maskestørrelse at det faste materialet i sin helhet blir holdt tilbake i den indre tanken,

prosessparametre som temperatur og pH reguleres i henhold til prosessens egenart, prosessvæsken omrøres ved at den indre tank roteres i forhold til den ytre tank, slik at

25 skovler og strømningsbrytere mellom ytre og indre tank sørger for en skånsom agitasjon av materialet, og

det faste materialet blir ved behandlingens slutt forsiktig komprimert ved hjelp av et hev- og senkbart lokk på den indre tank forut for og under utpumping av prosessvæske.

Spesielle fordelaktige utførelsesformer av prosesstanken og av fremgangsmåten fremgår av de uselvstendige krav.

I det følgende skal det redegjøres nærmere for de enkelte trekk og funksjoner ved oppfinnelsen gjennom redegjørelse for en normal driftssyklus, og med henvisning til de vedlagte tegninger, hvor

Figur 1 viser et tverrsnitt i vertikalplanet av en utførelsesform av oppfinnelsen, hvor enkelt detaljer utenfor snittflaten er antydnet med stiplet linje,

10 Figur 2a viser innertanken av den på figur 1 viste tank, med silerister og bærende konstruksjon sett fra siden,

Figur 2b viser innertanken av den på figur 1 viste tank også sett fra siden, idet silerister og bærekonstruksjon er utelatt for å vise andre detaljer,

Figur 3 viser lokket på innertanken sett ovenfra,

15

Figur 1 viser en dobbelttank 1 ifølge oppfinnelsen, med en tett vegg 2 i den ytre beholder og en perforert vegg 3 i den indre beholder, og felles opplagringspunkter 4,5 for begge beholdere om en vertikal akse R-R. Den ytre beholderen har et lokk 6, og den indre beholderen et fortrinnsvis perforert lokk 7, idet lokket 7 er nedsenkbart i forhold til

20 beholderne om en splineaksel 15. Begge lokkene 6, 7 er forsterket med kaveller 30.

Under beholderen er vist en kuleventil 8 gjennom hvilken materiale kan pumpes inn i tanken for behandling, samt gjennom hvilken residuet kan fjernes etter endt behandling.

Mellom innervegg 3 og yttervegg 2 er antydnet skovler 9, noen av hvilke er fast til ytterveggs 2 innside, mens andre er fast til innerveggs 3 utside, slik at samvirket

25 mellom disse når innertanken roterer, nødvendigvis gir en omrøring av væskeinnholdet i beholderen. Det er også vist pumpeskovler 10 ved innertankens bunn, hvis størrelse og utforming vil bidra til ytterligere omrøring av tankinnholdet. For enkelte prosesser kan det også være hensiktsmessig med en gravskovl, som på figur 1 er antydnet med henvisningstall 11. Det er videre vist påfyllingsrør 12 for spylevann ved toppen av

30 beholderen, et påfyllingsmunnstykke 13 for eksempel for nitrogen ( $N_2$ ) ved bunnen av

beholderen, samt et dreiespjeldventil 14 for uttak av ekstraksjonsvæske, også nær bunnen av beholderen.

Figur 2a og 2b viser skisser av innertanken, hvor man gjenfinner en del av de detaljer som også fremgår av figur 1, så som yttervegg 3, rotasjonsakse R-R, lokk 7, skovl 9 (fast til innertankens utside), pumpeskovl 10 ved innertankens bærende struktur 17, samt silerister 18 i tankveggenes åpne deler. Det er også antydning av et spiralformet styrespor 19 for lokkets 7 bevegelse under senking og heving, hvilket styrespor 19 ligger på innsiden av tankveggen 3. Ved toppen av tanken finnes et mannhull 20 som vanligvis er forseglet med et tett lokk. Med stiplede linjer  $L_t$  og  $L_b$  er det også antydning av lokkets 7 øvre og nedre posisjon. På figur 2b vises også trinser 23 som er egnet til å samvirke med styresporene 19 ved lokkets heving og senking.

Figur 3 viser lokket 7 med perforerte områder 20 dekket av silerister, tilførselsrør 21 og gummislanger 22 (på tegningen vist 4 stk.) for spylevæske til dyserøret 24 som tilføres gjennom påfyllingsrør 12 (fig. 1) gjennom en særskilt mekanisme ved lokkets sentrum. En pil til venstre for figur 3 viser innertankens rotasjonsretning under normal operasjon. Tegningene viser også forgreningen av tilførselsrørene 21 som går langs medbringerne 25 fra akslingen for så å bli koplet til kjemikaliersistants gummislanger 22 eller lignende som går fra tilførselsrørene 21 til dyserøret 24 på lokkets periferi. Disse vil ikke bli utsatt for særlig stor slitasje siden det kun blir en nedoverrettet bevegelse proporsjonalt med rotasjonen når lokket senkes.

Sileristene 18 kan skiftes til ønsket maskestørrelse alt etter hva slags materiale som behandles. Omrøringen i tanken skjer ved at innertanken settes i rotasjon, slik at det oppstår rørevirkning mellom yttertank og innertank ved hjelp av skovlene 9, samt eventuelt som følge av ytterligere pumpeskovler 10 ved innertankens bunn. Ved en foretrukket utførelsesform av oppfinnelsen, er pumpeskovlene 10 ved innertankens bunn slik utformet at de presser væske fra sentrum av tanken ut mot tankens vegger, mens skovlene mellom inner- og yttertank sørger for å løfte væsken i tanken. Totalresultatet



blir en hovedsakelig nedadrettet væskestrøm i sentrum av beholderen, og en god, men skånsom omrøring. Pumpeskovler 10 kan være på innsiden av innertanken, slik tegningen viser, eller de kan legges på utsiden, eventuelt begge deler.

- 5 For å tillatte maksimal væskebevegelse, er det fordelaktig at store områder av innertanken er perforert og dekket med silerister, og at den bærende struktur bare er tilstrekkelig til å gi tanken nødvendig styrke og stivhet. Det er således foretrukket at også innerlokket 7 er perforert og forsynt med silerister 18. Innerlokket er slik anordnet at det kan senkes ned i innertanken. Dette gjøres enklest ved å plassere det på et
- 10 akselboss 29 (fig. 2b) til en spline-aksel 15 eller tilsvarende, slik at nedsenkingen enkelt kan iverksettes gjennom en bremsing av splineakselen 15 i forhold til innertankens rotasjon, for eksempel ved hjelp av en hydraulisk brems 16. Ytre styrespor 19 på innertankens innside sørger for at lokket hele tiden holdes i riktig posisjon i forhold til tanken under denne operasjonen. For maksimal smidighet er det hensiktsmessig å
- 15 forsyne lokket 7 med en slags trinser 23 som ruller langs disse styresporene 19 når lokket beveger seg opp eller ned. Styresporene 19 er i en foretrukket utførelsesform slik at lokket 7 gjør ca. en halv omdreining i forhold til innertanken fra toppstilling til bunnstilling. Stigningen på styresporet bør ikke være over 27°.
- 20 Det er også foretrukket, slik det er vist på figur 3, å anbringe et dyserør 24 på lokkets 7 innside, hvilket rør er utstyrt med et antall dyser. Formålet med dette er å dusje/ spyle innertankens vegger mens nedsenking av lokket 7 foregår, slik at hele residuet blir samlet i bunnen av innertanken, og slik at lokkets 7 bevegelse ikke blir hindret av fasthengende rester på silerister 18 eller i styrespor 19. Dette vil også hindre at faste
- 25 rester kan havne på oversiden av lokket 7 når det senkes ned. Tilførselen av væske skjer mest hensiktsmessig gjennom kanaler i den sentrale aksling. Spylevæsken blir normalt tatt fra prosesstanken via egen pumpe.

- Det viktigste formålet med å kunne senke lokket 7 er å sørge for en regulert
- 30 komprimering av råstoffet/ residuet i tanken før ekstraksjonsvæsken pumpes ut, slik at

minst mulig ekstraksjonsvæske blir holdt tilbake. Dette hindrer videre at residuet kan virke som et filter som holder tilbake noe av det som ønskes overført med ekstraksjonsvæsken. Ved å holde dette materialet på plass, blir tanken også stabilisert, slik at rotasjonshastigheten kan økes, og man får en bedre sentrifugering av residuet.

5

Den mest hensiktsmessige måten å feste innertanken på ved dens øvre ende er gjennom medbringere 25 som igjen er festet til drivakselen. Lokket 7 kan være festet med et såkalt splineboss 29 til splineakselen 15. Når det gjelder det ytre lokket 6, er dette forsterket med kaveller 30 og tett festet til yttertanken, fortrinnsvis ved bolter.

10

Ved en ytterligere foretrukket utførelsesform av oppfinnelsen finnes det i sentrum av innertanken en såkalt graveskovl 11, som fortrinnsvis er opphengt i en aksling 27 som er ført gjennom sentrum av splineakselen 15, som i så fall er utformet med et langsgående hulrom med dimensjon til å romme graveskovlens aksling 27. Graveskovlens 11

15 funksjon er ved behov å fjerne materiale fra tankens råstoffinntaks- / utløpsåpning 8 sentralt i bunnen av tanken. Det er lite behov for automatisk styring av denne idet den kun betjenes etter behov.

Ved oppstart av en typisk prosess pumpes råstoff inn i innertanken gjennom den  
20 nedenfor beliggende ventil 8. Uttaket for ekstraksjonsvæsken 14 er rett ved siden av inntaket for råstoffet, og kan ha form av en dreiespjeldventil. Dette pumpes til egen tank for videre behandling.

Den enkleste måten å fjerne det faste materialet fra tanken på, er ved å fylle tanken med  
25 væske og sette innertanken i motsatt rotasjon i forhold til vanlig drift, mens lokket 7 beholdes i toppstilling.

Det er også hensiktsmessig å ha mulighet for å tilføre gass til beholderen. Det mest vanlige er å tilsette inertgass for å hindre oksidering av råstoffet, men det kan også

tilsettes spesiell gass som tilsetningsmiddel dersom det ønskes. For dette formål kan det alt etter situasjonen være hensiktsmessig med mer enn ett påfyllingsrør for gass.

Det er gjerne drenering 28 i nedre lagerets nedre del, slik at lageret kan dreneres før en eventuell overhaling eller skifting. Lageret kan også dreneres for eventuell væske under lengre stopp av tanken eller før skifting av ekstraksjonsvæske.

Når det gjelder tankens opplagring med vertikal rotasjonsakse R-R, er det klart at et lite avvik fra helt vertikal opplagring i prinsippet er mulig, men at dette ikke er hensiktsmessig ut ifra hensyn til belastninger både på tank og ikke minste på tankens lagre ved rask rotasjon av innertanken.

Rotasjonshastigheten for innertanken kan varieres innen vide grenser, men typisk vil den velges slik at banehastigheten ligger i området 0,5 - 1 m/s ved tankens periferi for en vanlig prosess. Etter endt prosessering sentrifugeres gjerne residuet for å få ut mest mulig av prosessvæsken. Under sentrifugeringen vil banehastigheten ved periferien typisk være 3,5 - 6 m/s.

En prosesstank ifølge oppfinnelsen vil normalt også inneholde et antall i og for seg kjente innretninger egnet til å styre prosessparametre, primært temperatur og væskemengde. Dette kan dreie seg om helt enkle elektriske varmeelementer, varmevekslere og/ eller sløyfer for tilføring av damp til tanken. I et typisk tilfelle er det lagt en dampsløyfe 31 som i hovedsak dekker hele den koniske bunnen, der inntaket 32 av damp er i yttertankens nedre del, før overgangen til den koniske bunnen. Uttaket 33 av kondensat er i nærheten av tankens bunnventil. Hele sløyfen 31 er montert slik at den ligger for eksempel 10 cm over den koniske bunnen, dette fører til at det blir god kontakt mellom dampsløyfen og ekstraksjonsvæsken. Det kan også legges en dampkappe rundt hele tanken for på denne måten å varme den opp. For å utnytte mest mulig av dampens energi blir ekstraksjonsvæsken sirkulert i en ekstern varmeveksler hvor kondensatet fra

dampsløyfen er med på å varme opp ekstraksjonsvæsken, eller for forvarming av ekstraksjonsvæsken under påfylling.

Det er ikke noe til hinder for at innertankens konstruksjon kan ytterligere forsterkes slik  
5 at lokket 7 kan utføre en presseffekt på materialet når lokket 7 senkes.

Tankens størrelse kan også varieres innen vide grenser, og begrenses egentlig bare av behovene ved den eller de aktuelle applikasjoner.

10 I det følgende skal det gis noen praktiske eksempler på bruk av anordningen ifølge oppfinnelsen.

#### Eksempel 1

15 Ensilering av fiskeslo, avskjær etc.

Råstoffet som er slakteslo av fisk, pumpes inn i tanken ifølge oppfinnelsen fra slakteriet mens innertanken allerede roterer. Råstoffet kommer inn i senter 8 av tankens bunn og inn i den indre, perforerte tanken. Prosessvann og blodvann blir skilt fra råstoffet inne i tanken og pumpet ut via uttaket 14 på yttertanken. Når tanken er passe full blir det

20 etterfylt med vann og tilsatt syre til ønsket konsentrasjon via et perforert doseringsrør 26 som går langs yttertankens skovler/ strømningsbrytere 9. Syren vil således bli jevnt fordelt fra bunn og til topp. Tanken varmes til ønsket temperatur og ensileres. Under ensileringen kan lokket 7 senkes etter ønske og behov. Etter endt ensilering, kjøres lokket 7 ned mens man spyler innertankens vegger 3 gjennom dyser på røret 24 og  
25 ensilasjen pumpes ut via uttaket 14 inntil tanken er tom for fri væske. Deretter kjøres hastigheten opp og det gjenværende materiale blir sentrifugert for ensilasje. Når det gjenværende faste materiale skal pumpes ut, snus dreieretningen på innertanken og lokket 7 kjøres i topp, samtidig som det fylles ønsket mengde vann på tanken og det gjenværende materiale pumpes ut via kuleventil 8 for videre behandling eller

30 deponering.

### Eksempel 2

Krabbe-, hummerskall etc.

- Skallet blir først knust gjennom en kvern før det pumpes inn på tanken via kuleventil 8. Når innertanken er full, fylles det opp med vann og varmes den til ønsket temperatur og
- 5 tilsettes for eksempel enzymer. Konsentrasjonen av flytende tilsetningsstoffer som for eksempel syre eller base reguleres via det perforerte doseringsrøret 26 langs yttertankens strømningsbryter 9. Når enzymeringstiden er over kjøres lokket 7 ned og enzymeringsvæsken blir pumpet ut via uttaket 14 i yttertanken, skallet sentrifugeres så for å få ut siste rest av enzymeringsvæske. Væsken kan så prosesseres videre til f. eks.
- 10 smakstilsetning. På samme som i eksempel 1 er det foretrukket å spyle veggene 3 i innertanken når lokket 7 senkes ned.

- Lokket i tanken kjøres i topp og det fylles på med vann. Når tanken er full, varmes den til ønsket temperatur og det tilføres syre til ønsket konsentrasjon. Skallet blir
- 15 avmineralisert til kitin under kontrollerte forhold, der doseringen av syre foregår jevnt etter hvert som avmineraliseringen foregår. Når skallet er avmineralisert, kjøres lokket 7 ned under spyling av veggene 3 i innertanken og tanken tømmes via uttaket 14 i yttertanken. Materialet sentrifugeres. Deretter kjøres lokket 7 i topp og det blir fylt på vann for vasking av skallet. Lokket kjøres så ned og vaskevannet pumpes ut via uttaket
- 20 14 i yttertanken. Når kitinet til slutt skal pumpes ut, gjøres dette som i eksempel 1 ved at tanken fylles med vann og settes i rotasjon i motsatt retning, mens ventilen 8 i bunnen åpnes og tanken tømmes for kitin.

### Eksempel 3

- 25 Plantemateriale for ekstraksjon av eteriske oljer etc.
- Ønskede planter/ urter fylles på tanken i form av en vandig pumpbar suspensjon som pumpes inn via inn-/ uttaket 8 eller eventuelt fylles på via mannhullet 20 i ytter- og innertank. Tanken fylles opp med ønsket ekstraksjonsvæske. Tanken varmes til ønsket ekstraksjonstemperatur. Under ekstraksjonen kan lokket 7 senkes etter ønske og behov.
- 30 Etter ønsket ekstraksjonstid kjøres lokket 7 ned og ekstraksjonsvæsken pumpes ut via

uttaket 14 i yttertanken. Materialet sentrifugeres og presses eventuelt før eventuell ny ekstraksjon gjennomføres eller før utpumping av residuet via kuleventil 8.

#### Eksempel 4

##### 5 Krill

Ved dette eksempelet er det hensiktsmessig at tanken er installert på en krilltråler. Når krillen fanges, presses kjøttet ut på vanlig måte. Krillavfallet blir pumpet inn på tanken via ventil 8 og når innertanken er full av krillskall fylles den opp, fortrinnsvis med sjøvann. Væsken varmes til ønsket temperatur. Det vil nå inntre en autolyse av skallet.

- 10 Når autolysen er over vil alt proteinet være oppløst. Lokket 7 kjøres da ned under samtidig spyling av innertankens vegger 3, og presser skallene sammen, og den proteinrike og oljeholdige væsken kan pumpes ut via uttaket 14 i yttertanken, for eventuell videre behandling. Det gjenværende skallet i tanken sentrifugeres for å få ut mest mulig av den proteinrike og oljeholdige væsken. Deretter fylles tanken fortrinnsvis
- 15 med ferskvann, skallene vaskes og prosedyren for utpumping gjentas. Etter at tanken er tom for vaskevann og skallene er sentrifugert, fylles tanken igjen med ferskvann, det tilsettes syre i ønsket mengde som i de foregående eksempler for å avmineralisere skallet. Tanken varmes til ønsket temperatur, syrekonsentrasjon og temperatur holdes konstant under hele avmineraliseringsprosessen. Når avmineraliseringsprosessen er
- 20 over, etter typisk 1 til 4 timer, senkes lokket 7 slik at det klemmer/ presser sammen skallet/ kitinet og den mineralrike væsken pumpes ut via uttaket 14 i yttertanken. Når tanken er tom for væske, snus rotasjonsretningen og lokket heves til topp posisjon samtidig som det fylles på nytt vann for vask av kitinet. Dette vaskes og klemmes sammen før vaskevannet pumpes ut via uttaket 14 i yttertanken. Når alt vaskevannet er
- 25 pumpet ut, sentrifugeres kitinet for resterende vaskevann.

Tanken fylles til slutt med vann og lokket kjøres i topp. Rotasjonsretningen snus og kitinet pumpes ut via inn-/ uttaket 8 til innertanken.

De ovenfor angitt eksempler er kun å anse som nettopp eksempler på hvordan prosesstanken ifølge oppfinnelsen kan benyttes, idet rammen av oppfinnelsen kun begrenses av patentkravene.

Patentkrav:

1. Prosesstank for skånsom behandling av dens innhold, spesielt beregnet for behandling av organisk materiale, omfattende et røreverk,  
**karakterisert** ved at prosesstanken er en dobbeltank omfattende en indre tank (3) med  
5 perforerte veggområder som er roterbart opplagret i en ytre tank med tilnærmet vertikal rotasjonsakse (R-R), at den indre tank (3) er forsynt med silerister (18) som dekker de perforerte områder av veggen, at det mellom indre og ytre tank er anordnet skråstille skovler eller strømningsbrytere (9) som under rotasjon av indre tank bidrar til omrøring av væsken i tanken, samt at den indre tanken er forsynt med et hev- og senkbart lokk (7)  
10 som fortrinnsvis også er perforert og forsynt med silerister.
2. Prosesstank som angitt i krav 1,  
**karakterisert** ved at den indre tanken (3) er roterbart opplagret i et øvre lager (5) i yttertankens lokk (6), og at et nedre lager (4) i hovedsak fungerer som en styring for  
15 innertanken.
3. Prosesstank som angitt i krav 1,  
**karakterisert** ved at råstoffpåfylling og materialuttapping skjer gjennom et rør som kommuniserer med en ventil (8) konsentrisk med bunnakslingen.  
20
4. Prosesstank som angitt i krav 1,  
**karakterisert** ved at strømningsbryterne (9) mellom indre og ytre vegg (3, 2) dels er stasjonære strømningsbrytere på innersiden av ytterveggen(2), dels er skovler som er festet på innerveggen (3) utside og som roterer med den indre tanken.  
25
5. Prosesstank som angitt i krav 1,  
**karakterisert** ved at lokket (7) på innertanken er lagret på et boss (29) til en splineaksel (15) el. tilsvarende konsentrisk med tankene, og at lokket (7) kan senkes ned ved å bremse splineakselen (15).



6. Prosesstank som angitt i krav 1,

**karakterisert** ved at det er festet dyserør (24) langs kanten av lokket (7), hvilke dyserør kan benyttes til å spyle innertankens vegger (3) spesielt i forbindelse med nedsenking av lokket (7).

5

7. Prosesstank som angitt i krav 1,

**karakterisert** ved at det er pumpeskovler (10) i innertankens (3) bunn som bidrar til å pumpe ekstraksjonsvæske fra sentrum og ut mot veggene av innertanken(3), og slik at væskedelen vil passere gjennom sileristene (18) og ut til skovlene/ strømningsbryterne

10 (9) mellom den indre (3) og den ytre vegg (2).

8. Prosesstank som angitt i krav 1,

**karakterisert** ved at akslingen (15) til lokket (7) er hul og at det gjennom dette hulrommet er plassert en aksel (27) til en gravskovl (11) som kan senkes ned i tilfelle  
15 pakking for å grave vekk materiale foran inntaket/ utløpet som kommuniserer med ventilen (8).

9. Prosesstank som angitt i krav 1,

**karakterisert** ved at på innertankens (3) innside er montert styringsskiner (19) som  
20 samvirker med spor eller trinser (23) på lokket (7) som styrer lokkets bevegelse ved heving og senking, samtidig som de fungerer som ytre "gjenger" for lokket.

10. Prosesstank som angitt i krav 1,

**karakterisert** ved at det er montert perforerte rør (26) langs hele lengden av en eller  
25 flere av strømningsbryterne (9) på yttertanken (2) for tilførsel av ønskede kjemikalier.

11. Fremgangsmåte for prosessering av organisk materiale så som fiskeavfall,

krabbeskall, krill eller plantemateriale hvor skånsom omrøring av materialet er ønskelig, ved at materialet tilføres en prosesstank sammen med regulert mengde av prosessvæske

30 og underkastes en behandling under i og for seg kjente betingelser i prosesstanken,

**karakterisert** ved følgende trinn:

det benyttes en dobbelt prosesstank omfattende en indre tank med perforerte veggområder og silerister, hvilken indre tank er roterbart opplagret med en tilnærmet vertikal rotasjonsakse i en ytre tank,

- 5 sileristene velges med slik maskestørrelse at det faste materialet i sin helhet blir holdt tilbake i den indre tanken,
- prosessparametre som temperatur og pH reguleres i henhold til prosessens egenart, prosessvæsken omrøres ved at den indre tank roteres i forhold til den ytre tank, slik at skovler og strømningsbrytere mellom ytre og indre tank sørger for en skånsom agitasjon
- 10 av materialet, og
- det faste materialet ved behandlingens slutt blir forsiktig komprimert ved hjelp av et hev- og senkbart lokk på den indre tank forut for og under utpumping av prosessvæske.

12. Fremgangsmåte ifølge krav 11,

- 15 **karakterisert** ved at påfylling av materiale skjer ved tankens bunn gjennom en bunnventil og et påfyllingsrør som er konsentrisk med tankens aksling, mens innertanken roterer og med innertankens lokk i toppstilling.

13. Fremgangsmåte ifølge krav 11,

- 20 **karakterisert** ved at prosessvæsken er et ekstraksjonsmiddel.

14. Fremgangsmåte ifølge krav 11,

**karakterisert** ved at innertankens vegger spyles med vann i hele eller deler av prosessperioden gjennom dyser plassert på undersiden av det bevegelige lokket.

25

15. Fremgangsmåte ifølge krav 11,

**karakterisert** ved at residuet sentrifugeres og/ eller presses etter endt prosessering.

16. Fremgangsmåte ifølge krav 11,  
**karakterisert** ved at innertankens lokk senkes og heves i visse intervaller under prosessen.
- 5 17. Fremgangsmåte ifølge krav 11,  
**karakterisert** ved at innertankens dreieretning snus når tanken tømmes for fast materiale.
18. Fremgangsmåte ifølge krav 11,  
10 **karakterisert** ved at væsken tappes ut fra eget uttak i bunn av yttertanken som ikke har forbindelse med innertanken.
19. Fremgangsmåte ifølge krav 11,  
**karakterisert** ved at råstoffet blir pumpet inn med en transportvæske som for eksempel  
15 vann, og at denne væsken blir tappet ut fra uttaket i yttertankens bunn og at denne transportvæsken eventuelt kan sirkulere mens den transporterer råstoffet inn i tanken.
20. Fremgangsmåte ifølge krav 11,  
**karakterisert** ved at spylevæsken til dyserøret langs innertankens lokk blir tatt fra  
20 prosessstanken.

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## Sammendrag

Prosesstank for skånsom behandling av dens innhold, spesielt beregnet for behandling av organisk materiale, omfattende et røreverk. Prosesstanken er en dobbelttank omfattende en indre tank (3) med perforerte veggområder som er roterbart opplagret i en ytre tank med tilnærmet vertikal rotasjonsakse (R-R). Den indre tanken (3) er forsynt med silerister (18) som dekker de perforerte områder av veggen, og det er mellom indre og ytre tank anordnet skråstilte skovler eller strømningsbrytere (9) som under rotasjon av indre tank bidrar til omrøring av væsken i tanken. Den indre tanken er videre forsynt med et hev- og senkbart lokk (7) som fortrinnsvis også er perforert og forsynt med silerister. Det beskrives også en fremgangsmåte for behandling av organisk materiale så som fiskeavfall, krabbeskall, krill eller plantemateriale ved bruk av prosesstanken.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 28 JUN 2001

WIPO PCT

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Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO00/00062	International filing date (day/month/year) 21.02.2000	Priority date (day/month/year) 01.03.1999
International Patent Classification (IPC) or national classification and IPC7 B 01 F 7/28		
Applicant Mikalsen, Kaare Mikal et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.  
  
☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of \_\_\_\_\_ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  30.08.2000	Date of completion of this report  13.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Wiva Asplund/ELY Telephone No. 08-782 25 00

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/NO00/00062

## I. Basis of the report

### 1. With regard to the **elements** of the international application:\*

- ☒ the international application as originally filed
- ☐ the description:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the claims:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, as amended (together with any statement) under article 19  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the drawings:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

### 2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

### 3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

### 4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

### 5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/NO00/00062

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-20</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-20</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-20</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

Document cited in the International Search Report:  
DATABASE DIALOG INFO SERVICES (Online) MITSUBISHI HEAVY  
IND LTD: "Liquid tank for minute gravitational space"  
retrieved from FILE 347: JAPIO, accession no. 03761599  
XP002901111 abstract & JP 04 126699 A.

The cited document discloses a process double tank including a rotatable inner tank having openings at its peripheral edge. Guide vanes are fixed at the inner side of the outer tank.

The characterizing features in present claim 1 that the inner tank is provided with gratings and shovels which are arranged slantingly in the space between the inner and the outer tank and that a lid is arranged to be raised and lowered on the top of the inner tank is not disclosed in the cited document. This arrangement causes an effective treatment of organic material and a high yield of extracted material.

Therefore, the claimed invention is novel, is considered to involve an inventive step and to be industrially applicable.

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 03 November 2000 (03.11.00)	
<b>International application No.</b> PCT/NO00/00062	<b>Applicant's or agent's file reference</b> Process
<b>International filing date</b> (day/month/year) 21 February 2000 (21.02.00)	<b>Priority date</b> (day/month/year) 01 March 1999 (01.03.99)
<b>Applicant</b> MIKALSEN, Mikal et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 30 August 2000 (30.08.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Manu Berrod  Telephone No.: (41-22) 338.83.38
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